but the broad base is oblique, and the outer border is sloping, without a prominent angle.

The pedicels of the larger suckers on the tentacular club are very peculiar. They are, when extended, long and remarkably stout, their diameter being more than half that of the sucker. They are cylindrical, and are capable of being invaginated, toward the summit, so that they can be lengthened out or very much shortened by a sort of telescopic motion. The upper end is thick, and fits the basal part of the broad sucker like a piston. (Pl. LV, figs. 6, 6*a*.)

Two additional examples of this interesting species have been received. They are not in so good condition as the one originally described. The head and arms alone remain, but these are well enough preserved to show the characteristic color-marks. The first is considerably smaller than the specimen taken by Capt. Collins. It was taken from a cod, on the western part of the Grand Bank, N. F., by Capt. Johnson and crew, of the schooner "Augusta Johnson," (lot 962). Presented to the U. S. Fish Commission, June, 1881. The last specimen was taken in 180 fathoms, near the N. E. part of George's Bank, and presented to the U. S. Fish Commission by Capt. Chas. Anderson and crew, of the schooner "Alice G. Wonson," October, 1881, (lot 980).

Brachioteuthis, gen. nov.

Allied to *Chiroteuthis*. Differs in having the lateral connective cartilages of the siphon simple, long-ovate, and the corresponding cartilages of the mantle in the form of simple, linear ridges; a rhombic caudal fin; pen with a simple, linear, anterior portion, suddenly expanding into a much broader, lanceolate, posterior portion, which is naturally infolded; arms slender, the ventral ones not distinctly obliquely compressed; tentacular club without a spoon-like cavity at tip.

The siphon has a valve and dorsal bridle as in *Chiroteuthis*, and the suckers, so far as preserved, are similar, but those of the club are more numerous, and their pedicels apparently had a less prominent bulb below the sucker.

In addition to the following new type-species, this genus probably includes the *Chiroteuthis Bonplandii* Verany, from the eastern Atlantic.

B. Bonplandii, as figured, has a very similar pen, but the shape of the caudal fin is different, and the arms are more nearly equal in length. The arms are also represented as having small swellings at the tips. Its tentacular arms are not known.

Brachioteuthis Beanii, sp. nov.

PLATE LV, FIGURES 3–3*b*; PLATE LVI, FIGURES 2–2*a*.

Male: Body rather small, tapering backward to an acute posterior end; dorsal mantle-edge with a broad obtuse angle; caudal fin large in proportion to the body, broad rhomboidal; outer angles prominent, anterior to the middle; the anterior lobes project forward considerably beyond the insertions, and are rounded. The form of the fin is much like that of *Ommastrephes*. Head thickened at the bases of the arms, not so large in proportion to the body as in *C. lucertosa*. Eyes large, eye-lids thin. Siphon large, with two strong dorsal bridles; internal valve broad, rounded, somewhat back from the orifice; connective cartilages long-ovate, broadest behind (fig. 2*a*); dorsal cartilage of neck oblong, with a strong median ridge and two deep parallel grooves. Lateral cartilages of mantle (fig. 2) are simple linear ridges, extending to the edge of the mantle. Arms not very large, somewhat rounded, long and slender; the dorsal ones are much smaller and shorter than the others; two lateral pairs nearly equal in size and length, more than two-thirds the length of the mantle. Ventral arms shorter and much more slender than the lateral, more than half the length of the mantle; the ventral arms show but little of the compressed, oblique form, so conspicuous in the preceding species, and the crest or fold of skin along the outer-ventral angle is narrow, thin, and not very conspicuous; the suckers on the ventral arms are in two alternating, not distant, rows, often appearing almost as if in one row toward the base, where they become smaller, but are of the normal cup-shaped form, with finely denticulate rims and slender pedicels; the tips of both ventral arms are much injured, but small, normal, long-pediceled suckers can be traced to the tip of the left arm; the right arm is denuded of its skin and suckers at the tip. The suckers of the four lateral arms are in two rather close rows, larger, oblique, low cup-shaped, attached by slender pedicels, which are somewhat swollen just below the suckers; most of them have lost their horny rings; marginal membranes rudimentary. Web between the arms, rudimentary. Tentacular arms very long and slender, in alcohol about twice the length of the mantle; a few scattered, sessile suckers are found along the whole length of the arms; tentacular club well-developed, long-ovate, oblique, with a thick wrist and flat or concave sucker-bearing face; suckers small and very numerous, crowdedly arranged in many rows (probably sixteen rows or more), some of the middle ones larger than the rest;

suckers not well preserved, but all appear to have been alike in form; pedicels long and slender, with a smooth and not very large swelling below the base of the sucker; the suckers have lost their horny rims, but the sheaths are shaped much like those of *C. lacertosa*, the distal portion being hood-shaped, with a lateral opening, while the basal part is swollen laterally. The tip of the club is simple, without any such spoon-shaped appendage as is found in the preceding species. Buccal membrane large, with a free thin edge, which scarcely forms angles.

Pen (Pl. LV, fig. 3*a*) has a narrow, linear anterior portion, consisting of more than half its length, decreasing in width backward, then suddenly expanding into the posterior portion, which is broad and thin, and infolded, so as to form a large, compressed posterior cavity; the anterior portion is concave beneath, with no midrib, the edges excurved and slightly thickened; when spread out and flattened the posterior portion has a lanceolate form, rather abruptly widening anteriorly and very gradually tapering backward, with a double midrib, and some delicate lines parallel to it, while the lateral expansions are very thin and delicate. Color of body mostly destroyed, in the typical specimens, but small, light purplish brown chromatophores are uniformly scattered over the parts best preserved; this is also the case on the head, siphon, and outer surfaces of the arms, where the skin is well preserved; scattered spots also occur on the inner surfaces, between the suckers.

A larger specimen (station 994), which has lost its head and pen, and, therefore, cannot be positively identified, has a much darker color. It is dark purplish brown over the whole body.

The male has the mantle 62^{mm} long; length of caudal fin, 31; its breadth, 36; end of tail to base of arms, 85; length of dorsal arms, 26; of second pair, 48; of third pair, 45 + (tips gone); of fourth pair, 35; of tentacular arms, 118; of sucker-bearing portion of club, 16; breadth of tentacular arms, 2; of club, 4; of lateral arms, at base, 3·5; of ventral arms, 3; diameter of eye-ball, 8; of the largest suckers of lateral arms, 1·2; length of pen, 62; of anterior, narrow portion, 38; its breadth anteriorly, where widest, 2; where narrowest, 1·25; length of posterior portion, 24; its breadth, 8^{mm}.

The teeth of the odontophore (Pl. LV, fig. 3*b*) form seven rows; the median ones have a large, acute central, and two small, lateral denticles; the inner lateral teeth have a large, acute, inner denticle and a very small outer one; the next to the outer lateral teeth are somewhat stouter than the outermost, which are slender, strongly curved, and very acute; no marginal plates were observable.

The supposed female has lost the tail, but the arms are in better condition than those of the male; it differs from the male in having distinctly smaller suckers on the lateral arms. Length of dorsal arms, 27^{mm}; of second pair, 44; of third pair, 46; of fourth pair, 37; of tentacular arms, 120; of club, 16^{mm}.

Two typical specimens were obtained off Martha's Vineyard, at stations 1031 and 1033, in 255 and 183 fathoms; one of doubtful identity, at 994, in 368 fathoms, by the U. S. Fish Commission, in 1881. All three were from fish-stomachs.

I take pleasure in dedicating this interesting species to Dr. T. H. Bean, the ichthyologist, who took charge of the fishes on the "Fish Hawk," this season.

Chiroteuthis lacertosa, sp. nov. (See p. 299.)

Chiroteuthis Bonplandii ?, p. 299 (*non* Verany.)

PLATE LVI, FIGURES 1–1*f*.

A nearly complete male specimen of a *Chiroteuthis*, lacking only the tentacular arms and the distal portion of the left ventral arm, was received after the preceding pages were put in type. The stumps of the tentacular arms, remaining, bear the same kind of unarmed sessile suckers as did the arm described on p. 299, and figured on pl. 47, figs. 1–1*b*. It appears to be a new species, and is very distinct from *C. Bonplandii*. The sessile arms are very large in proportion to the head and body, and the ventral arms are much larger than any of the others. The body is small, obconic, tapering rapidly backward to the origin of the caudal fin, where it becomes very small, and continues to taper to the very slender posterior end. The median dorsal angle of the mantle-edge projects far forward, as a broad angular lobe; lateral angles rounded and not prominent. Caudal fin relatively large, as compared with the body, broad-ovate in outline, widest near the middle, tapering backward to an acuminate, slender tip; very broadly rounded laterally, narrowing abruptly anteriorly; the anterior lobes are small, rounded, and project only slightly forward beyond the insertions. Siphon large, with a well-formed valve, far back from the orifice; dorsal bridles rudimentary. Connective cartilages on the base of the siphon, broad-ovate, ear-shaped, with two rounded prominent lobes projecting into its concavity, one posterior, the other ventral, so that the pit is three-cornered (fig. 1*b*). The corresponding connective cartilages of the mantle consist of two pits, separated by a prominent, triangular tubercle (fig. 1*c*). Head large, in proportion to the body, tapering backward from the

bases of the arms. Eyes large; lids thin and simple, without a distinct lachrymal sinus. Behind and below each eye there is a long (4^{mm}), slender, clavate, soft papilla (fig. 1*f*), probably olfactory in function.

The sessile arms are large and, except the ventral, unusually rounded; the inner sucker-bearing faces are much less differentiated than usual, scarcely differing from the other sides in color, and bordered by only a slight or rudimentary membrane on each side; the rounded prominences from which the sucker-pedicels arise are also colored and not much raised. The dorsal arms are rather long and tapering, but much shorter and smaller than the others, slightly compressed and with a slight median crest distally. The next pair are similar in form and structure, but considerably longer and larger. The third pair are much longer and larger, with the outer angles well rounded, and a strong median crest extends nearly to the base, but is wider distally, where the arms are strongly compressed. The ventral arms are considerably longer and stouter than the third pair, and very different from all the others in form; they are strongly compressed in the direction parallel with the median plane of the head, and have the lower and outer angles well rounded, and the sucker-bearing face wide and scarcely differentiated from the lateral faces; but on the superior lateral side there is a wide and thick crest running the whole length of the arms, giving them a strongly and obliquely compressed appearance. The suckers on the ventral arms are smaller, fewer, and more distant than on any of the others; those at the bases are largest and three or four stand nearly in a single row; farther out, along the middle of the arm, they are distantly arranged in two rows and rapidly become small. The left ventral arm shows no signs of being hectocotylized; the right one, however, has lost half its length by mutilation. On all the other arms the suckers are regularly and much more closely arranged in two rows, and decrease more gradually in size from near the base to the tips.

The suckers *on all the arms* are similar in form; they are rather deep, narrowed at the rim, slightly constricted above the middle, and swollen below, and very oblique at the base; the pedicels are slender and nearly laterally attached; the horny rims are very deep and oblique, and strongly denticulated on the outer or higher side, but on all the arms they are *smooth on the inner side;* the median, outer denticles are long, slender, close together; laterally they become shorter, broader, acute-triangular and curved forward. On the larger suckers the outer teeth are obtuse, but on the distal ones they become

more slender and acute. The margins of the suckers are surrounded with small, elongated scales. (Pl. LVI, figs. 1*d*, 1*e*.)

The buccal membrane is thin and much produced, with the angles little prominent; it is attached to the arms by eight thin, but wide, bridles, the two superior ones united together near their origin. The web between the arms is rudimentary but distinct. The pen (fig. 1*a*) is very unlike that of *C. Veranyi*, as figured and described by D'Orbigny. It has a long, narrow shaft of nearly uniform width, and a long posterior portion, a little wider than the shaft, corresponding in length to that of the caudal fin; at the commencement, this portion expands into narrrow, free, incurved margins, but these unite quickly so as to form a long, narrow, angular, tubular portion, tapering to a very slender tip; this portion (1*a*″) has a dorsal keel, with a groove each side of it, two dorsal angles and a ventral angle along each side; the narrow shaft has a dorsal keel, with the sides bent down abruptly, nearly at right-angles, and a little incurved, so as to produce a squarish keel above, with a deep angular groove below, while the very narrow margins bend outward abruptly (1*a*′); the shaft increases very slightly in width, to near the subacute anterior end, but preserves the same form, and there is no distinct dilation of the margin anteriorly, such as D'Orbigny figures in the pen of *C. Veranyi*, nor does the posterior portion resemble his figure, though if split open and flattened out, it would resemble it more nearly.

This specimen is an adult male, in the breeding condition, for its spermatophore-sac is much distended with spermatophores. The color is much like that of *C. Veranyi*. It is everywhere thickly specked with small, purplish brown chromatophores, except on the buccal membrane and the bases of the tentacular arms, where there are but few; the head around the eyes and the end of the siphon are darker; a row of very distinct, rather large, round, dark purple spots runs along the inner surface of the ventral arms, just outside of, and alternating with, the upper row of suckers, which they about equal in size.

Total length, to end of ventral arms, 383^{mm}; to end of third pair, 366^{mm}; to end of dorsal arms, 298^{mm}; tail to dorsal mantle edge, 125^{mm}; to base of dorsal arms, 178^{mm}; length of dorsal arms, 120^{mm}; of second pair, 150^{mm}; of third pair, 188^{mm}; of ventral, 205^{mm}; length of caudal fin, 60^{mm}; its greatest breadth, 41^{mm}; breadth of head at eyes, 20^{mm}; of dorsal arms, 7^{mm}; of third pair, 10^{mm}; of ventral arms, 13^{mm}; of bases of tentacular arms, 3^{mm}; diameter of largest suckers of lateral arms, 2·25^{mm}.

Brown's Bank, off Nova Scotia, taken from the stomach of a cod (lot 956). Presented to the U. S. Fish Commission by Capt. Wm. Dempsy and crew, of the schooner "Clara F. Friend," June, 1881.

The internal anatomy is somewhat peculiar in several respects, but will not be fully described in this place.

The gills are short and broad, with very long lamellæ. The reproductive organs occupy a large part of the visceral cavity. The testicle is a large, thick, broad-ovate organ, with the two sides folded together around and closely united to the large cœcal lobe of the stomach. The testicle does not extend back beyond the origin of the caudal fin, the visceral cavity being very narrow in that region. The prostate gland and vesiculæ seminales are large and swollen, and the spermatophore-sac is also large. The efferent duct is large and long, extending far forward; it expands at the end into a spade-like form, with an acute tip; its orifice is oblique ear-shaped, situated on one side, near the end, and is protected by a lobe or flap. The stomach is saccular and the large cœcal lobe is not very long. The liver is thick. The posterior aorta goes far back, nearly to the origin of the fin, before dividing, for the median septum of the branchial cavity is placed far back. The ink-sac has the ordinary pyriform shape.

A smaller, female specimen, probably belonging to this species, was taken by Captain Z. L. Tanner, on the "Fish Hawk," October 10, off Delaware Bay, in 435 fathoms, station 1048.

This specimen agrees nearly with the type specimen, described above, in the form and proportions of the body, head, arms, caudal fin, pen, etc., and in the structure and denticulation of the suckers. The caudal fin is slightly broader in proportion, while the suckers are deeper and relatively smaller, especially those on the ventral arms, which are decidedly smaller than those on the lateral ones. They are finely and sharply denticulated on the outer edge, as in the type.

The color is, however, quite different, for in this example the skin and flesh are translucent and beautifully specked with regular, round, often rather large, not crowded, dark brownish red chromatophores; the larger of these, especially on the under side of the fin and body, are ocellated; on the head and arms the chromatophores become smaller and more crowded, more nearly as in the type. The row of large dark purple spots, along the ventral arms, are, in this example, decidedly raised and wart-like. One of the tentacular arms is perfect. These are very long and slender, and bear, along their whole length, relatively large, rounded, wart-like, dark purple, sessile suckers, having a small central pit. These suckers are about two-

thirds as broad as the diameter of the arm, and from close to the base of the arm to the distal fourth they are separated by spaces mostly equal to about twice their diameter; distally they are less numerous. The tentacular club is well developed, with a broad marginal membrane along each side, having scalloped or notched edges. The club terminates in an ovate, subacute, dark purple, hollow organ, with its opening on the outer side of the arm. The suckers (Plate LV, fig. 5) are regularly arranged in four rows. The stalk is long, with a dark purple, fluted summit, surmounted by a very slender pedicel bearing the sucker, which is hooded, with a lateral opening; the horny ring bears several slender, sharp teeth on the outer side, the central one being much the longest;* the soft rim of the sucker is covered with many rows of small scales, the inner ones with acute tips. The lateral suckers do not alternate with the median, but the two arise close together, opposite each other, and in line with the teeth on the edge of the marginal membrane. The inner surface of the club is specked with brown chromatophores, and the marginal membranes are crossed by brown lines, corresponding to the notches in their edges.

Total length, to end of ventral arms, 194^{mm}; to end of third pair, 150; to end of dorsal arms, 127; tail to dorsal mantle edge, 59; to base of dorsal arms, 86; length of dorsal arms, 41; of second pair, 56; of third pair, 69; of ventral, 110; of tentacular arms, 180; of club, 17; breadth of club, 5; length of caudal fin, 27; its greatest breadth, 24; of dorsal arms, 4; of third pair, 5; of ventral arms, 8; of bases of tentacular arms, 1·5; diameter of largest suckers of lateral arms, 1.

This species differs widely from *C. Bonplandii* in the sessile arms, etc. It is much more nearly related to *C. Veranyi*, from which it differs decidedly in the pen; in the suckers; and in the caudal fin, if these parts are correctly described and figured, for the latter.

Desmoteuthis tenera, sp. nov.

PLATE LV, FIGURES 2–2*d*. PLATE LVI, FIGURE 3.

Two small, but perfect, specimens of this species were taken in the "trawl-wings"† this season, at station 952, in 388 fathoms.

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* The arm, figured on Pl. XLVII, figs. 1–1*b*, does not agree with this, and may belong to a different species; but the difference in its suckers may be due to injury.

† The "trawl-wings," which were first invented and used by the U. S. Fish Commission, this summer, consist of fine nets attached to a support extending out from each end of the trawl-beam. When in use they are about two feet above the sea-bottom. They are provided with an interior funnel-shaped net to prevent the escape of animals captured. They have been of great value to us for capturing, and retaining in

The specimens are both males, but show no positive evidence of hectocotylization. The body is long, somewhat fusiform, slightly smaller in advance of the middle. The tissues are exceedingly thin, delicate, pale, and translucent, so that the pen and other organs can be seen through the mantle. Anteriorly the edge of the mantle is attached to the head, medially, by a muscular commissure, and there is *no free edge* (such as D'Orbigny figures in *T. pavo*) at the narrow middle portion of this band. This commissure is broader within the mantle, and there is another large, oblique, muscular commissure, extending forward to the edge of the mantle, on each side, extensively uniting the inner surface of the mantle to the sides of the siphon. These commissures leave only a rather narrow opening to the gill-cavity, on each side, and one small ventral one, and the interior ventral cavity is partitioned off from the lateral ones.

The siphon is large, projecting forward between the lower sides of the large eyes; it has no valve in the ordinary place, but toward the base, on the dorsal side, there are two erect, rounded, ear-like flaps, each with a small papilla (*i'*), and a rounded, valve-like, raised median fold and a central papilla (*i*) in front of them. (Pl. LV, fig. 2*d*.)

The caudal fin is comparatively small, narrow-ovate, tapering to a short, blunt posterior end, and with the anterior lobes narrowed and scarcely projecting beyond the insertions. The eyes are very large and prominent, occupying the whole of the sides of the head, wide apart dorsally, but nearly in contact beneath; eye-lids thin, entire.

Arms rounded, rather slender, tapering to slender tips; those of the third pair are much the longest, and like the second pair, bear along the distal half suckers much larger than the proximal ones; tips short, with few small suckers. The dorsal and ventral arms are about equal, and not much more than half as long as the third pair; they bear smaller suckers, in two rows, regularly decreasing distally. The second pair is intermediate in length between the 1st and 3d pairs, with two rows of larger suckers on the outer half, suddenly decreasing distally, with minute ones close to the tip. The large suckers (fig. 2*b*, *c*) on the second and third pairs of arms are much larger than the others,

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excellent condition, many kinds of free-swimming deep-sea animals, not otherwise obtainable, or if taken in the trawl, crushed by the great masses of fishes, echinoderms, actiniæ, etc., usually taken in every haul, in these waters.

Among the things captured in the "trawl-wings" are not only several cephalopods (including *Alloposus*, *Lestoteuthis*, *Rossia*), but *Cymbulia calceolus* and other Pteropods; vast numbers of *Sagitta*, one of them bright orange-colored; numerous species of Copepod crustacea, some of them of great size; Schizopods; Salpæ; Acalephs, including one very remarkable new form of Siphonophora, etc.

but similar in form, deep cup-shaped, convex in the middle, obliquely attached, with a smooth horny rim, except on the distal ones, which have blunt denticles externally. There are about sixteen of these suckers on each of the lateral arms, but eight or ten are decidedly larger than the rest. The large suckers commence nearly at the middle of the arms and extend to very near the tips. The suckers on all the arms are deep, urceolate, with somewhat contracted apertures; they mostly have the horny rim entire; the distal ones on the ventral arms are finely denticulated. The third pair of arms have a thin median carina on the outer side, along the distal third.

All the arms have a wide marginal or protective membrane along the inner edges, outside the suckers; these membranes are strengthened by transvere thickened, muscular processes, opposite each sucker; between these the membrane recedes so that the edge is scolloped. The ventral arms have also a membrane along the outer, ventral angle. I am unable to detect any positive signs of hectocotylization, either in the dorsal or ventral arms. Perhaps the presence of the very large suckers on the lateral arms may be a sexual character, but if so, they are symmetrical on the two sides.

The tentacular arms (Pl. LVI, fig. 3) taper from the thickened base, and in our specimens equal in size, and are not much longer than, those of the third pair; club well developed, rather broader than the rest of the arm, with a dorsal keel and wide, marginal, protective membranes; the suckers are arranged in four regular rows; the larger suckers are about equal in size to the larger ones of the dorsal arms; of these there are eight or nine in each row, the marginal ones are scarcely smaller than the median ones and similar in shape, but more oblique; all these suckers are cup-shaped, obliquely attached, with long pedicels; the marginal ring is denticulated all around, the teeth on the outer or higher side being slender, sharp and incurved; those on the inner side minute. The distal part of the club is short, and covered with four rows of small suckers, similar to the larger ones in shape and armature; at the tip is a small group of minute suckers, apparently unarmed. At the proximal end of the club there is a group of small denticulated suckers; and four irregular rows of minute, connective suckers, attached by short pedicels, extend along the inner surface of the arm to the middle or beyond; these are interspersed with minute tubercles, more distinct distally, near the club. The outer buccal membrane is narrow, without distinct angles.

The pen is very thin, delicate, pale yellow; the anterior portion is very narrow and slender; the posterior third, commencing opposite the

origin of the fins, is lanceolate, with two faint, close ribs along the middle, and less distinct parallel lines each side of these; the tip is an acute hollow cone, about 10^{mm} long.

Color of mantle, pale yellowish white, translucent, with scattered, conspicuous, round, or more or less elliptical, purplish brown spots, 2 to 3^{mm} in diameter, and 5 to 10^{mm} apart. Eyes dark purplish or chocolate-brown; head, siphon, and outer surfaces of arms thinly specked with purplish brown chromatophores.

The length of the largest specimen is 163^{mm}, from end of tail to tip of 3d pair of arms; length of mantle, dorsally, 116^{mm}; mantle to base of dorsal arms, 11^{mm}; diameter of eyes, 17^{mm}; breadth of head across eyes, 30^{mm}; breadth of body, 26^{mm}; length of caudal fin, 45^{mm}; its breadth, 28^{mm}; length of dorsal arms, 20^{mm}; of 2d pair, 25^{mm}; of 3d pair, 32^{mm}; of 4th pair, 20^{mm}; of tentacular arms, 35^{mm}; of club, 11^{mm}; breadth of lateral arms, at base, 3.5^{mm}; diameter of largest suckers, 2·5^{mm}.

The teeth of the odontophore (Pl. LV, fig. 2*a*) form seven rows, as usual; the median teeth have a very large and long median denticle and a small one at each lateral angle; the inner lateral teeth have a large inner denticle and a very small outer one; the two outer rows are rather stout; there is also a marginal row of small, more or less elliptical plates, with their outlines rather indefinite.

Off Martha's Vineyard, 87½ miles from Gay Head, station 952, in 388 fathoms. U. S. Fish Commission, Aug. 4, 1881.

This species resembles *Taonius pavo* (for which I at first mistook it) in form, but is very different in color and other characters. The suckers, which are remarkably flat in *T. pavo*, and strongly serrate, are in this very deep, and the edge of the ring is generally entire. The pen is also different.

Notes on the visceral anatomy.

Anatomically, this species closely resembles *Desmoteuthis hyperborea*. (See Pl. XXXIX, fig. 1.) It has a similar short, thick, compressed, ovate liver, with the intestine in a groove along its ventral edge, and the small ink-sac imbedded in its antero-ventral surface. The gills are laterally placed, short, with long lamellæ. The heart is small, irregularly tubular, oblique, with four angles or lobes where joined by the principal vessels. The efferent vessels from the gills are long and conspicuous, because the bases of the gills are distant from the heart. The alimentary tract consists of a short, narrow rectum, attached to the liver, and ending in a bilabiate aperture,

guarded by two slender papillæ; of a long, rather wide, tubular portion, extending back to the base of the caudal fin, and covered, along the ventral side, with lateral rows of clusters of small follicular glands, which, near the liver, diverge into two, separate, large, lateral clusters; posteriorly, where the rows of follicles cease, there is a small, firm, bean-shaped, glandular organ, lamellose within (? a gizzard); this is followed by a long tubular, or fusiform, more or less saccular stomach and cæcal appendage, running back nearly to the end of the body; a constriction at the origin of the cæcal appendage. The testicle is a rather small, slender, lanceolate organ, attached laterally, for its whole length, to the side of the cæcal appendage. The prostate gland and vesiculæ seminales have their usual position, at the base of the left gill, but they are small, and probably not fully developed; the efferent duct extends over and a short distance beyond the base of the gill, and is slender and pointed. The renal organs are very different from those of the common squids (*Loligo* and *Ommastrephes*). The posterior part of the anterior vena-cava becomes glandular in front of the heart; there it parts, sending a long, smooth vein to the base of each gill; there, each of these veins expands into an ovate renal organ, before joining the branchial auricles.

Family SEPIOLIDÆ (See p. 367.)

During the explorations made by the "Fish Hawk," the present season, we were fortunate in obtaining additional specimens, including both sexes, of the very interesting and beautiful species described by me in 1878, under the name of *Sepiola leucoptera*. These specimens have given me an opportunity to make dissections, which I had not done with the few specimens previously known. These studies show that it has no pen; that the presence of the remarkably enlarged suckers of the second pair of arms is not confined to the male; and that this species is the type of a very distinct genus, especially remarkable for being the only known genus, among *Myopsidæ*, that has round pupils and the eye-lids free all around. In fact, it shows quite conclusively that this division of the Decacera into two groups, based on the presence or absence of free eye-lids, is purely artificial and of little or no systematic value. Therefore the characters attributed to the family, *Sepiolidæ*, must be modified to a considerable extent, to include this genus.

In its internal anatomy this genus differs but little from *Sepiola*, *Heteroteuthis* and *Rossia*, notwithstanding its remarkable divergence in respect to the eyes and pen. Other genera of Sepiola-shaped

cephalopods agree with this in lacking a pen. Of such genera, Professor Steenstrup has recently [Vidensk. Selsk. Skr., 6 R., nat. math. Afd., i, 3, 1881, p. 213] described two: *Idiosepius* and *Sepiadarium*, both of which he associates with the Sepidæ, because the ventral arms are hectocotylized. One of these (*Idiosepius*) has the mantle free dorsally, as in *Rossia*, but with ovate connective cartilages on the sides; the other has a dorsal commissure, as in *Sepiola*, and lateral commissures, much as in *Taonius*. To me, these seem more nearly allied to *Loligo* than to *Sepia*. In addition to these, I have to add another genus,* from the Bay of Yeddo, Japan. Of this genus I have two species, collected by Prof. E. S. Morse.

Stoloteuthis Verrill, gen. nov.

Type, *Sepiola leucoptera* Verrill. (See p. 347.)

Body short and thick, well-rounded. Head large, united to mantle by a broad dorsal commissure. Eyes large; pupils round; eye-lids free all around. No pen. Mantle thick, extending farther forward

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* **Inioteuthis**, gen. nov. Body, lateral fins, and dorsal commissure of the mantle as in *Sepiola;* lateral connective cartilages of the siphon, oblong-elliptical, with the groove open behind, fitting a linear ridge on each side of the mantle. Eye-lids free below, adherent above. Pen absent. Arms webbed only slightly, at base; suckers, both on sessile arms and tentacles, as in *Rossia*. Left dorsal arm hectocotylized somewhat as in *Sepiola Rondeleti* (see description by Steenstrup), but more extensively, with a large, prominent, fleshy, concave, ear-like structure, near the base, extending across the inner surface of the arm, and replacing both rows of suckers, their pedicels becoming confluent with the marginal membrane.

The outer side of this organ is divided by a median notch into two lobes; the distal one enclosing a large papilla, apparently formed of two confluent and modified sucker-pedicels.

Inioteuthis Japonica V. This small species has the suckers in two rows on all the arms. It appears to be the *Sepiola Japonica* D'Orbigny. The suckers of all the arms, but especially those of the dorsal and upper lateral arms, are much larger in the male than in the female. Tentacular club narrow, with small suckers, in about eight rows. The fins are small, nearly semicircular.

Inioteuthis Morsei V., sp. nov. This is easily distinguished from the preceding by the presence of four crowded rows of suckers on all the arms; the suckers are attached by slender pedicels, which arise from the top of prominent, thickened, basal stems. The tentacular clubs are well-developed, with exceedingly numerous, very minute suckers, in more than sixteen rows. Fins large, situated in advance of the middle of the body. Dorsal and ventral arms about equal; two lateral pairs longer, the third pair slightly longer than the second. Mantle edge, beneath, with a large emargination; dorsal commissure broad.

No males of this species are in the collection; therefore I refer it to this genus only provisionally. It has no pen.

beneath than laterally. Fins large, lateral. Siphon with an internal valve, in both sexes; connective cartilages oblong, with a central groove, fitting a linear ridge, on each side of the mantle; these do not extend to the edge of the mantle. Arms webbed for more than half their length, except between the ventral arms; second pair, in the male, and some females, with two or three much enlarged suckers near the middle. The suckers of all the arms are relatively larger in the male than in the female; dorsal arms of the male alike; their basal suckers are larger and more crowded than in the female; no other evidence of hectocotylization could be found.

Stoloteuthis leucoptera Verrill.

Sepiola leucoptera Verrill. (See p. 347.)

The largest specimen hitherto observed is an adult male, from station 947, in 312 fathoms. This differs but very little from the smaller male already described and figured (p. 348, Pl. XXXI, fig. 5), but it has, on the tips of both ventral arms, four rows of small suckers, while all the others, of both sexes, have but two rows, even to the extreme tips. The suckers on all the arms of this specimen are decidedly larger in proportion than on the females of nearly equal size, and the group of larger suckers on the second pair of arms is represented by one very large one, on each arm. More than half the female specimens also have the corresponding suckers much enlarged, but perhaps not so much so as the males. The large males appear to show some evidence of hectocotylization, in having the suckers near the base of both dorsal arms larger and more crowded than they are in the females, and the portions of the web bordering these arms appear to be somewhat thickened or swollen, a feature not present in the females. But I could detect no difference in the structure of the two dorsal arms, nor in the two ventrals. The tentacular arms are much swollen at base, especially the right one, while the club is narrower than the average width of the arm; just at the base of the club, along the upper edge of the 'wrist' there is a prominent free lobe or crest.

In alcohol, the integument appears very thick and rather soft. In life there appears to be a thick, gelatinous, transparent layer, outside the stratum containing the chromatophores.

The large male described above, in alcohol, is 40^{mm} long, from end of body to tip of lateral arms; breadth of body, 22; breadth of head, 20; breadth across extended fins, 38; length of lateral arms, from beak, 15^{mm}.

Stoloteuthis leucoptera.—Additional specimens examined.

Station.	Locality.	Fathom	When collected.	Received from.	Specimens. No. Sex.
947	Off Martha's Vineyard	312	Aug. 9, 1881	U S. F. C.	1 l. ♂ : 1 j.
952	" "	388	" 24, 1881	"	1 l. ♀
998	" "	302	Sept. 8, 1881	"	2 ♀
999	" "	266	" "	"	1 ♀
1026	" "	182	" "	"	3 j.

Rossia sublevis Verrill. (See p. 354.)

This species was dredged by the U. S. Fish Commission, in considerable numbers, during the season of 1881, off Martha's Vineyard, in 153 to 458 fathoms. The eggs were taken in August and September, containing large embryos. These eggs were laid in the oscules of sponges, and are scarcely distinguishable from those of *R. Hyatti.*

Rossia sublevis.—Additional specimens.

Station.	Locality.	Fath.	Date.	Rec'd from.	Specimens. No. Sex.
	Off Martha's Vineyard.		1881		
924	S. ¼ W. 83½ m. from Gay Head,	160	July 16	U. S. F. C.	11. ♀ :eggs
925	S. ½ W. 86 m. from Gay Head,	224		"	21. ♂
939	S. by E. ¼ E. 98 m. from Gay Head,	258	Aug. 4	"	19 : eggs.
943	S.S.W. 83 m. from Gay Head,	153	" 9	"	1
945	S. by W. ¾ W. 84½ m. from Gay Head,	202	"	"	11. ♂ : 4 ♀
946	S. by W. ¾ W. 87½ m from Gay Head,	241	"	"	2 ♂ : 3 ♀
947	S. by W. ¾ W. 89 m. from Gay Head,	312	"	"	6
951	S. 85 m. from Gay Head,	219	" 23	"	5 ♂ : 2 ♀
952	S. ¼ E. 87½ m. from Gay Head,	388	"	"	2 ♀
997	S S.W. ¼ W. 103½ m. from Gay Head,	335	Sept. 8	"	1 ♂ : eggs.
1025	S.S.W. ¼ W. 95 m. from Gay Head,	216	"	"	3 ♀
1026	S.S.W. ¼ W. 93½ m. from Gay Head,	182	"	"	2 ♀
1028	S.S.E. ⅝ E. 108½ m. from Gay Head,	410	" 14	"	1 l. ♂
1029	S.S.E. ⅝ E. 109½ m. from Gay Head,	458	"	"	1 j.
1032	S.S.E. ½ E. 107 m. from Gay Head,	208	"	"	5
1033	S.S.E. ½ E. 106 m. from Gay Head,	183	"	"	1 j.: eggs.
1045	Off Delaware Bay,	312	Oct. 10	"	3 l. ♂ : 1 j.

Heteroteuthis tenera Verrill. (See p. 357.)

During the dredging season of 1881, this species was again taken in many localities, off Martha's Vineyard, in 45 to 182 fathoms.

The eggs of this species, containing, in some instances, embryos so far developed as to permit specific determination, have been taken in many localities, in 65 to 130 fathoms, by the U. S. Fish Commission, in August and September, associated with the adults. These eggs were particularly abundant at stations 865–867, 872, 873, 874, in 1880; and at stations 922, 940, 949, in 1881. Some of those taken in August are nearly ready to hatch, while others, taken as late as September, are freshly laid. The eggs are directly and firmly

attached to the surface of various objects, such as dead shells (of *Pecten*, etc.), annelid tubes, hydroids, fragments of Echini, ascidians, etc. They are placed near together, or side by side, so as to form larger or smaller groups. They are pearly white, about 3^{mm} in diameter, nearly round, except that the attached side is somewhat flattened, and the upper surface has a small, conical process in the middle.

Heteroteuthis tenera.—Additional specimens.

Station.	Locality.	Fath.	Date.	Rec'd from.	Specimens. No. Sex.
	Off Martha's Vineyard.		1881		
918	S. ¼ W. 61 m. from Gay Head,	45	July 16	U. S. F. C.	1 ♂ : 1 ♀
919	S. ¼ W. 65 m. from Gay Head,	51½	"	"	4 ♂
920	S. ¼ W. 68½ m. from Gay Head,	61	"	"	3 ♂ : 5 ♀
921	S. ¼ W. 73 m. from Gay Head,	65	"	"	6 ♂ : 6 ♀
922	S. ¼ W. 77 m. from Gay Head,	69	"	"	1 ♀ : eggs.
940	S. by E. ½ E. 97 m. from Gay Head,	130	Aug. 4	"	1 ♀ : eggs.
944	S.S.W. 82 m. from Gay Head,	124	" 9	"	1 ♂ : 1 ♀
949	S. 79½ m. from Gay Head,	100	" 23	"	1 : eggs.
950	S. 75 m. from Gay Head,	69	"	"	1 ♂ : 2 ♀
1026	S.S.W. ¼ W. 93½ m. from Gay Head,	182	Sept. 8	"	1 ♂
1027	S.S.E. ¾ E. 105½ m. from Gay Head,	93	" 14	"	1 ♂
1038	N. lat. 39° 59′; W. long. 70° 06′.	146	" 21	"	5 ♂ : 2 ♀
1043	N. lat. 38° 39′; W. long. 73° 11′.	130	Oct. 10	"	1 ♂

Argonauta argo Linné (p. 364.)

In the American Naturalist, xv, p. 908, another specimen of this species is reported by Rev. Samuel Lockwood to have occurred at Long Branch, N. J., September, 1881. The shell is stated to have been fresh. This is the third specimen obtained on the coast of New Jersey, since 1876.

Alloposus mollis Verrill. (See p. 366.)

Octopus (?) sp., Verrill, Bulletin Mus. Comp. Zool., viii, p. 109, pl. 4, fig. 3, 1881.

PLATE L. PLATE LI, FIGURES 3, 4.

Two very large females of this species were taken by the U. S. Fish Commission; this season, off Newport, R. I. One was from station 937, in 506 fathoms, the other from 994, in 368 fathoms.

They were nearly equal in size. The weight of the first, when fresh, was found to be over 20 pounds. Length from the posterior end of the body to the tips of the dorsal arms 787^{mm} (31 inches); to tips of 2d pair, 812^{mm} (32 inches); to tips of 3d and 4th pairs, 711^{mm} (28 inches); length of mantle, beneath, 178^{mm} (7 inches); beak to tips of 3d pair of arms, 559^{mm} (22 inches); breadth of body, 216^{mm} (8·5 inches); breadth of head, 280^{mm} (11 inches); diameter of eyes, 64^{mm} (2·5

inches); of largest suckers, 10mm (·38 of an inch). It was measured while living.

The body, when living, was short and broad, and so soft and gelatinous that, when out of water, it could not retain its natural form. When placed in a large pan, it flattened out and filled up the vessel, like a mass of rather stiff jelly. Color, in life, pale bluish white, speckled with rusty orange-brown chromatophores; inner surfaces of arms dark purplish brown; suckers white.

Two detached and somewhat mutilated arms, with portions of a third arm and of the basal web, of a large specimen, formerly described by me as *Octopus ?* sp., but which I now refer to this species, were taken by Mr. Agassiz, on the "Blake," in 1880, at station 336, N. lat. 38° 21′ 50″, W. long. 73° 32′, in 197 fathoms.

The largest of these arms is 420mm long and 36mm broad. The suckers are large, prominent, subglobular, with a contracted aperture, and having a thin membrane around the outer margin. They form two alternating, rather distant rows, except near the base, where several that are somewhat smaller than those farther out, stand nearly in one row, with wide spaces between them. Diameter of largest suckers, 9 to 11mm; distance between their centers, 20 to 35mm. Color, dark purple. (Pl. LI, fig. 3.)

Smaller specimens were taken by us, this season, off Martha's Vineyard, in 310 to 715 fathoms; stations 938, 952, 953.

Alloposus mollis.—Additional specimens.

Station.	Locality.	Fath.	Date.	Rec'd from.	Specimens. No.	Sex.
	Off Delaware Bay.					
336	38° 21′ 50″; 73° 32′,	197	1880	Blake Ex.	1	l. frag.
	Off Martha's Vineyard.		1881			
937	S. by E. ½ E. 102 m. from Gay Head,	506	Aug. 4	U. S. F. C.	1	l. ♀
938	S. by E. ½ E. 100 m. from Gay Head,	310	"	"	1	j.
952	S. ¼ E. 87½ m. from Gay Head,	388	" 23	"	1	j.
953	S. ½ E. 91½ m. from Gay Head,	715	"	"	1	j. ♀
994	S.S.W. ¼ W. 104½ m. from Gay Head,	368	Sept. 8	"	1	l. ♀

Octopus Bairdii Verrill. (See p. 368.)

Numerous additional specimens of this species were dredged off Martha's Vineyard, in 120 to 410 fathoms, by the U. S. Fish Commission, this season.

Octopus Bairdii.—Additional specimens.

Station.	Locality.	Fath.	Bottom.	Date.	Specimens. No. Sex.
	Off Martha's Vineyard.			1881	
925	S. ½ W. 86 m. from Gay Head,	224	sand, mud	July 16	1 l. ♂ : 3 j. ♂
939	S. by E. ½ E. 98 m. from Gay Head,	258	"	Aug. 4	1 ♂ : 1 ♀ : 1 j.
945	S. by W. ⅜ W. 84½ m. from Gay Head,	202	"	" 9	3 ♀ : 1 ♂
946	S. by W. ⅜ W. 87½ m. from Gay Head,	241	"	"	4 ♀ : 5 ♂ ; 2 j.
947	S. by W. ⅜ W. 89 m. from Gay Head,	312	"	"	1 l. ♀ : 4 ♂
951	S. 85 m. from Gay Head,	219	mud	" 23	4 ♀ : 2 ♂
952	S. ¼ E. 87½ m. from Gay Head,	388	sand, mud	"	4 ♀ : 2 ♂
994	S.S.W. ¼ W. 104½ m. from Gay Head,	368	mud	Sept. 8	1 l. ♂
997	S.S.W. ¼ W. 103½ m. from Gay Head,	335	"	"	1 j. ♂
998	S.S.W. ¼ W. 102½ m. from Gay Head,	302	"	"	1 ♂ : 1 ♀
1025	S.S.W. ¼ W. 95 m. from Gay Head,	216	"	"	4 j.
1026	S.S.W. ¼ W. 93½ m. from Gay Head,	182	"	"	1 l. ♂ : 1 l. ♀
1028	S.S.E. ⅜ E. 108½ m. from Gay Head,	410	"	" 14	1 ♂
1033	S.S.E. ½ E. 106 m. from Gay Head,	183	sd., gravel	"	1 ♂
1035	S.S.E. ½ E. 103½ m. from Gay Head,	120	sand	"	1 l. ♂
1045	Off Delaware Bay,	312	mud	Oct. 10	1 l. ♂
1047	Off Delaware Bay,	156	sand	"	1 ♀

Architeuthis Harveyi Verrill. (No. 27).

After the preceding pages were put in type, another specimen of *Architeuthis* was secured.

This was found dead, floating at the surface, near the shore, at Portugal Cove, a few miles from St. John's, Newfoundland, November 10, 1881. It was obtained by Mr. Morris, who had a photograph of it made by Mr. E. Lyons, of St. John's, and then shipped it to New York, packed in ice, by the steamer "Catima," Capt. Davies. Mr. Morris has given a brief description of this specimen in an article in the New York Herald of Nov. 25, 1881. In Harper's Weekly of Dec. 10, accompanying an article on the same subject, apparently by the same writer, there is a wood-cut, apparently copied from the photograph.*

The specimen was purchased by Mr. E. M. Worth, and preserved, in alcohol, at his museum, 101 Bowery, N. Y., where I had a good opportunity to examine it about two weeks after it had been put in alcohol.

Although this is more nearly complete than any specimen hitherto brought to this country, the arms and suckers are not so well preserved, as in some of the other examples. All the sessile arms have lost more or less of their tips, so that the actual length cannot be given, and many of their suckers are either injured or lost; the

* This figure, though poor, gives a fair idea of the general appearance of the creature as it would look if lying flabby and collapsed on the shore. The peculiar appearance of the caudal fin was due to mutilation of that organ.

tentacular arms are also injured and most of the large suckers of the clubs are destroyed; the caudal fin was not only torn by handling, but one-half of it had, apparently, been destroyed and the wound healed before the death of the creature,* so that its true form cannot be determined; the eye-balls were burst; and most of the pen was gone.

The head, eye-lids, siphon, and front edge of the mantle are, however, in fair condition, and as these parts have not been well preserved in any of the previous examples, some new and valuable facts were learned in regard to the structure of those parts. Many of the following characters are of generic value.

The eye-lids were large, not much thickened, and only slightly angulated, and with a shallow sinus; diameter of opening 120^{mm} (4·5 to 5 inches). The transverse nuchal crests, behind the eyes, are distinct, but only slightly elevated; of the longitudinal ones only one, on each side, is distinct but is short and not very high, the others (unless they had been rubbed off) are rudimentary. The siphon is large and broad; aperture 102^{mm} (4 inches) broad, slightly bilabiate, with a broad valve within; dorsal bridles moderately developed. Siphon-pit shallow, *smooth*. Connective cartilages on base of the siphon simple, long-ovate, slightly oblique, and only a little concave. Connective cartilages on the sides of the mantle, short and close to the front edge, very simple, consisting of a simple, slightly raised, longitudinal ridge. The dorsal angle of the mantle-edge extends considerably forward, as an obtuse angle; the lateral angles are also distinct. The body is large and broad in the middle and anteriorly, but tapers very rapidly to the base of the caudal fin, which is relatively small.

This specimen, when examined by me, measured as follows: length of mantle to lateral angles of the front edge, 4·16 feet; from edge of mantle to anterior base of ventral arms, 1·25 feet; circumference of body, 4 feet; length of caudal fin, tip to end of lobe, 1·75; breadth of one-half, measured from median line, 8 inches; length of tentacular arms, 15 feet; of the club, 2 feet; from first of the large suckers to tip, 1·67 feet; length of ventral arms (minus tips), 4·66 feet; their circumference at base, 8·5 inches; length of the dorsal arms (minus tips), 4·5 feet; their circumference at base, 7·5 inches; circumference of 2d pair of arms, at base, 7·5 inches; of 3d pair, 8·5 inches; diame-

* Owing to this fact, which was not understood by those who saw and figured it, at first, some of the cuts that have been printed give the tail very peculiar and remarkable forms.

ter of largest suckers of sessile arms, ·75 inch. The arms appear very stout, especially at base, and not very unequal in size. In form they agree well with those already described from previous examples. The ventral arms have the inner face broader than on the other arms, and the two crests along the outer angles are well developed. The suckers, so far as preserved, have the same characters as in the former examples; the more proximal of those on the ventral arms are closer together in a longitudinal direction, but the rows are farther apart than on the other arms. The mandibles are dark brown, the tooth on the anterior alar edge of the lower mandible is large and prominent.

The color, which is partially preserved, especially on the arms and on the ventral surface of the body, agrees pretty nearly with that of *Ommastrephes*, consisting of small purplish brown chromatophores, more or less thickly scattered over the surface. The back had a bleached appearance, as if the creature had laid upon the shore or floated at the surface, with the back exposed, for some time after death.

Owing to the mutilation of the tips of the ventral arms, hectocotylization could not have been detected, if it had originally existed. The sex, therefore, could not be determined without cutting open the mantle. By everting the edge of the mantle, as far as possible, I could see, owing to insufficient light, only the tips of the gills, which are situated rather far back, but the reproductive organs could not be seen.